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Filed : September 17, 1997

REMARKS

Claims 11-16 and 21-24 are presented for examination. Claims 21 and 23 are amended as set forth above to correct typographical errors. No other amendments have been made and no new matter is added. The specific changes to the claims are shown above with insertions shown in underlined text and ~~deletions shown in strikethrough text~~ or **[[bracketed]]**.

In the Office Action the Examiner objects to Claims 21 and 23, and rejects Claims 11-16 and 21-24 under 35 U.S.C. § 103. Applicants respectfully request reconsideration and withdrawal of the objections and rejections in view of the following remarks:

Discussion of Claim Objections

Claim 21 is objected to for recitation in the preamble of "a isolation structures." As suggested in the Office Action, Claim 21 has been amended by deleting the word "a." The preamble of Claim 21 as amended now recites in relevant part, "a plurality of isolation structures."

Claim 23 is objected to for recitation of "dielectric material." As suggested by the Examiner, "dielectric material" has been replaced by "halide-doped silicon oxide."

In view of the amendments to Claims 21 and 23, withdrawal of the objections is respectfully requested.

Discussion of Rejections under 35 U.S.C. §103

The Examiner has rejected Claims 11-16 and 21-24 under 35 U.S. C. §103(a). Specifically, the Examiner has rejected claims 11, 14-16 and 21-24 under 35 U.S. C. §103(a) as being unpatentable over Venkatesan et al., ("Venkatesan") (U.S. Patent No. 5,459,096) in view of Nishiyama et al., ("Nishiyama") (U.S. Patent No. 5,429,995). The Examiner also has rejected Claim 12 under 35 U.S. C. §103(a) as being unpatentable over Venkatesan in view of Nishiyama, and further in view of Bose et al., ("Bose") (U.S. Patent No. 5,492,858). In addition, Claim 13 is rejected under 35 U.S. C. §103(a) as being unpatentable over Venkatesan in view of Nishiyama, and further in view of Swan et al., ("Swan") (U.S. Patent No. 5,356,838).

To establish a *prima facie* case of obviousness "[t]he references themselves, not the invention itself, must provide some teaching whereby the applicant's combination would have been

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obvious.” *In re Gorman*, 933 F.2d 982 (Fed. Cir. 1991); *Heidelberger Druckmaschinen AG v Hantscho Commercial Products, Inc.*, 21 F.3d 1068 (Fed. Cir. 1993).

“Obviousness can not be established by hindsight combination to produce the claimed invention. . . . [I]t is the prior art itself, and not the applicant’s achievement, that must establish the obviousness of the combination.” *In re Dance*, 160 F.3d 1339 (Fed. Cir. 1998). “Our case law makes clear that the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references.” *In re Dembiczak*, 175 F.3d 994 (Fed. Cir. 1999); *see also Epochem, Inc. v. Southern California Edison Co.*, 227 F.3d 1361 (Fed. Cir. 2000).

Respectfully, there is no teaching, suggestion, or motivation to combine absent impermissible hindsight reconstruction of the claims.

Venkatesan in View of Nishiyama

The teachings of Venkatesan related to a semiconductor fabrication process using dual planarization levels in a trench isolation process. *See Venkatesan*, Title. Venkatesan recognized the necessity for improved planarization techniques to overcome global and localized non-uniform planarization induced by variations in the pattern-density of isolation regions. *See Venkatesan*, col. 3, lines 23-26. For example, Venkatesan sought to overcome planarization problems caused by substrates with isolation regions of various sizes, for example, substrate having large isolation regions. *See Venkatesan*, col. 4, lines 9-34. A problem with substrates having large isolation regions was that fill material was prematurely removed from the large dielectric isolation regions, resulting in “bowl” shaped isolation regions. *See Venkatesan*, col. 4, lines 12-16. The processes of Venkatesan sought to overcome such problems.

Nishiyama generally disclosed film isolation methods for metal wiring in order to avoid signal transmission delays caused by capacitance between wires. *See Nishiyama*, Summary of the Invention at col. 2, lines 30-41; Figures 2(A-C), 8(A-D), and 11(A-B) (Appendices E-G); Examples 1, 2, and 4. To overcome these problems, Nishiyama described deposition of a silicon oxide film containing fluorine onto the metal wires.

Neither Venkatesan nor Nishiyama provides a suggestion or motivation to combine their teachings. Venkatesan did not teach, suggest or provide a motivation to utilize a trench isolation fill material with a low dielectric constant. *See Venkatesan* throughout. This is not surprising in

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view of the problems that Venkatesan sought to overcome, namely, lack of planarity associated with diverse isolation regions, particularly large isolation regions.

Likewise, Nishiyama failed to provide any teaching, suggestion or motivation to be combined with Venkatesan. Nishiyama primarily disclosed film isolation of aluminum wiring. *See* Nishiyama, Summary of the Invention at col. 2, lines 30-41; Figures 2(A-C), 8(A-D), and 11(A-B) (Appendices E-G); Examples 1, 2, and 4. the skilled artisan would not be motivated, and Nishiyama provides no motivation, to use Nishiyama's film deposition process with the trench planarization methods of Venkatesan in order to fill the trenches of Venkatesan. The Examiner has not specified any motivation beyond concluding that it would have been obvious to combine the references. The rejections simply gloss over the very different contexts of Nishiyama and Venkatesan, under the *assumption* that the skilled artisan would have desired to use the low dielectric constant fill material of Nishiyama with the planarization/trench fill methods of Venkatesan. Nishiyama did not suggest or provide any motivation to use the silicon oxide film containing fluorine in other fabrication contexts outside of metallization. Isolation in the context of metal wires or metallization is different from isolation in context of trench isolation. What is good in one semiconductor fabrication context, is not necessarily good for the other.

The process of making the instantly claimed isolation structures, among others, was determined by the Patent Office to be patentable. *See* U.S. Patent No. 5,702,976. The instant claims are directed to unique structures that can result from that patented process. At the time of filing the instant application, the art did not show recognition of the particular advantages of the unique structures, for example, those using a halide doped fill material with trench isolation. The Office Action has not demonstrated a suggestion in the references themselves or in the art for the combination of a halide doped fill material with trench isolation, but rather has merely found all the elements of the claim separately in different contexts, and combined them with the benefit of hindsight. The instant application discloses that the inventors realized particular benefits associated with the use of halide doped fill material in the context of trench isolation, namely the ability to make trenches more shallow with use of a fill material with a lower dielectric constant, thereby resulting in less chance of void formation. At the time of the invention, these benefits were not recognized in the art in the context of shallow trench isolation.

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In sum, the skilled artisan would not be motivated to combine Venkatesan, which discloses methods for planarization of circuits using trench fill with Nishiyama which attempted to deposit an isolating film layer onto an aluminum wire. Only using impermissible hindsight to reconstruct the claimed invention does the Examiner combine these references.

Furthermore, the requisite motivation is not automatically provided by virtue of the fact that the references are from the same industry. There must be some specific motivation to combine the references in the manner asserted by the Examiner, which motivation is not present in this case. Again, here, the Examiner is using impermissible hindsight, rather than some teaching from the references themselves.

Venkatesan in View of Nishiyama, Further in View of Bose

As mentioned above, the Examiner rejected Claims 12 over Venkatesan in view of Nishiyama, further in view of Bose et al., ("Bose") (U.S. Patent No. 5,492,858). However, there is no suggestion or motivation to combine any of the cited references. The lack of suggestion or motivation to combine Venkatesan and Nishiyama has been discussed above. Bose described a LOCOS isolation process.

There also is no suggestion or motivation to combine Bose with Venkatesan and/or Nishiyama. As one example in support, Bose described a LOCOS isolation process. One of skill in the art would not look to combine the high temperature LOCOS process as disclosed by Bose with the metal wire isolation process of Nishiyama. Thus, there is not suggestion or motivation to combine Venkatesan with Nishiyam and further with Bose.

Venkatesan in View of Nishiyama, Further in View of Swan

As mentioned above, the Examiner rejected Claim 13 over Venkatesan in view of Nishiyama, further in view of Swan et al., ("Swan") (U.S. Patent No. 5,356,828). However, there is no suggestion or motivation to combine any of the cited references. The lack of suggestion or motivation to combine Venkatesan and Nishiyama has been discussed above. Furthermore, there also is no suggestion or motivation to combine Swan with Venkatesan and/or Nishiyama. Swan described methods for forming microtrenches. However, Swan disclosed no suggestion or motivation to utilize the doped silicon oxide of Nishiyama or the planarization

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methods of Venkatesan. Thus, there is no suggestion or motivation to combine Venkatesan with Nishiyama and further with Bose.

Accordingly, for all of the above-mentioned reasons, Appellants request withdrawal of the rejections for obviousness, and respectfully submit that the Claims are allowable over the art of record.

CONCLUSION

Applicants have endeavored to address all of the Examiner's concerns as expressed in the outstanding Office Action. Accordingly, arguments in support of the patentability of the pending claim set are presented above. In light of the above amendments and remarks, reconsideration and withdrawal of the outstanding rejections is specifically requested. If the Examiner finds any remaining impediment to the prompt allowance of these claims that could be clarified with a telephone conference, the Examiner is respectfully requested to initiate the same with the undersigned.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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